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Overview of the Amchitka Program

Three nuclear weapons tests were conducted on Amchitka Island in the Aleutian Island chain of Alaska. Project Longshot, conducted on October 29, 1965, was an 85-kt test under the Vela Uniform Program, designed to investigate seismic phenomena. Project Milrow, conducted on October 2, 1969, was an approximately 1-Mt "calibration test" of the seismic and environmental responses to the detonation of large-yield nuclear explosives. Project Cannikin, conducted on November 6, 1971, was a proof test of the Spartan antiballistic missile warhead with less than a 5-Mt yield. Project Longshot resulted in some surface contamination, even though the chimney did not extend to the surface.

At DOE's request, EPA collects environmental samples at many locations in the United States where nuclear testing occurred. This program, called the Long Term Hydrological Monitoring Program is designed to detect leakage from the shot cavity or to the offsite environment. The program primarily focuses on water samples collected from private wells, old wells on the site itself, and special wells that were put in place by DOE, EPA, and DOE contractors to monitor these sites.

The program on Amchitka Island has focused on three areas, Project Cannikin, Project Longshot, and Project Milrow, and along with background samples, comprises 54 locations. Two types of analyses are conducted on water samples: one for tritium analysis and one for gamma spectroscopy analysis. The tritium analyses are done by liquid scintillation analysis and depending on the preparation technique can have different minimum detectable activities. Samples with low historical levels of tritium are prepared through electrolytic enrichment, and its minimum detectable activity is in the 6-10 pCi/L range. Samples with higher activity are prepared through a distillation process, and the minimum detectable activity is around 300 pCi/L. Minimum detectable activity for gamma emitting radionuclides depends on radionuclide and due to long counting times is low.

The last water samples were collected on Amchitka in 1993. The results of the 1993 sampling show the highest tritium concentrations were observed from the Project Longshot site, with concentrations ranging from 10 ± 1.1 pCi/L to $1,400 \pm 130$ pCi/L, well below the maximum allowed by EPA's drinking water program. The tritium concentration in this well has been decreasing and, since this is the deepest well, suggests no continuing contribution from the test cavity. All other locations show results comparable to background.

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Under an Interagency Agreement with DOE the Long-term Hydrological Monitoring Program, RIENL scientists routinely collect and analyze water samples from wells, springs and surface waters in locations on the Nevada Test Site and from sites of past nuclear testing in other areas. Sampling is conducted yearly at the Shoal and Faultless sites in central Nevada, the Rubicon and Rio Blanco sites in Colorado, the Cnome and Gas Buggy sites in New Mexico, the Dribble site in Mississippi and Project LONGSHOT, MILROW, and CANNIKIN, conducted on Amchitka Island in the Aleutian Island chain of Alaska.

Amchitka Island is composed of several hundred feet of permeable tundra overlying tertiary volcanics. The ground water system consists of a freshwater lens floating on seawater; estimates of the depth to the saline-freshwater interface range from 3,900 to 5,250 ft. It is likely that any migration from the test cavities would discharge to the nearest salt water body, Project MILROW to the Pacific Ocean and Projects LONG SHOT and CANNIKIN to the Bering Sea. The sampling locations on Amchitka Island are shallow wells and surface sampling sites. Therefore, the monitoring network for Amchitka Island is restricted to monitoring of surface contamination and drinking water supplies.

The last sampling on Amchitka was conducted in 1993. The site was not sampled in 1995 due to a decrease in funding. Only water samples were collected in 1993. These samples were analyzed for gamma emitting radionuclides by gamma spectrometry and for tritium by both conventional and electrolytic enrichment methods to increase sensitivity. Results of the 1993 sampling show that the highest tritium concentrations were observed in samples from the Project LONG SHOT site, ranging from 10 ± 1.1 pCi/L to $1.4 \times 10^3 \pm 130$ pCi/L (0.01 to 1.6 percent of the DCG). The highest tritium results was obtained from well GZ No. 1, located near the Project LONG SHOT cavity. The tritium concentration in this well has been decreasing and, since this is the deepest well, suggests no continuing contribution from the test cavity.

The background sites had tritium concentrations ranging from 4.5 ± 1.7 pCi/L at the Base Camp to 30 ± 1.7 pCi/L at Constantine Spring Pump House, equivalent to 0.01 to 0.03 percent of the DCG. Samples from the Project CANNIKIN site yielded tritium concentrations ranging from 16 ± 1.6 pCi/L to 23 ± 1.8 pCi/L (0.02 to 0.03 percent of the DCG). Project MILROW samples yielded tritium concentrations ranging from 13 ± 1.6 pCi/L to 36 ± 2.0 pCi/L (0.01 to 0.04 percent of the DCG).

The first time a water source is sampled the samples are analyzed for gross alpha and beta, plutonium 238-239, strontium 89-90, uranium 234, 235, 238 and enriched tritium.

Results of sampling conducted by the LTHMP are published in the U.S. Department of Energy Nevada Field Office Annual site Environmental Report and the U.S. EPA Offsite Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas. These reports are readily available to the public.

7.4.8 AMCHITKA ISLAND, ALASKA

Three nuclear weapons tests were conducted on Amchitka Island in the Aleutian Island chain of Alaska. Project LONG SHOT, conducted on October 29, 1965, was an 85-kt test under the Vela Uniform Program, designed to investigate seismic phenomena. Project MILROW, conducted on October 2, 1969, was an approximately 1-Mt "calibration test" of the seismic and environmental responses to the detonation of large-yield nuclear explosives. Project CANNIKIN, conducted on November 6, 1971, was a proof test of the Spartan antiballistic missile warhead with less than a 5-Mt yield. Project LONG SHOT resulted in some surface contamination, even though the chimney did not extend to the surface.

Amchitka Island is composed of several hundred feet of permeable tundra overlaying tertiary volcanics. The groundwater system consists of a freshwater lens floating on seawater; estimates of the depth to the saline freshwater-interface range

from 3900 to 5250 ft (Chapman and Hokett, 1991). It is likely that any migration from the test cavities would discharge to the nearest salt water body. Project MILROW to the Pacific Ocean and Projects LONG SHOT and CANNIKIN to the Bering Sea (Chapman and Hokett, 1991). The sampling locations on Amchitka Island are shallow wells and surface sampling sites. Therefore, the monitoring network for Amchitka Island is restricted to monitoring of surface contamination and drinking water supplies.

Sampling on Amchitka Island, Alaska, is conducted every other year. Results for samples taken July 29 to Aug 1, 1993 are shown in Table D-9, Appendix D. All samples were above the MDC for tritium. The water from the background sites had tritium concentrations ranging from 4.5 ± 1.7 in a rain sample collected at the Base Camp to 30 ± 1.7 pCi/L at Constantine Spring Pump House, corresponding to 0.01 to 0.03 of the DCG. Samples from Project Cannikin site yielded tritium concentrations ranging from 16 ± 1.6 pCi/L to 23 ± 1.8 pCi/L; 0.02 to 0.03 percent of the DCG.

Baxterville, MS Public Drinking Water Supply

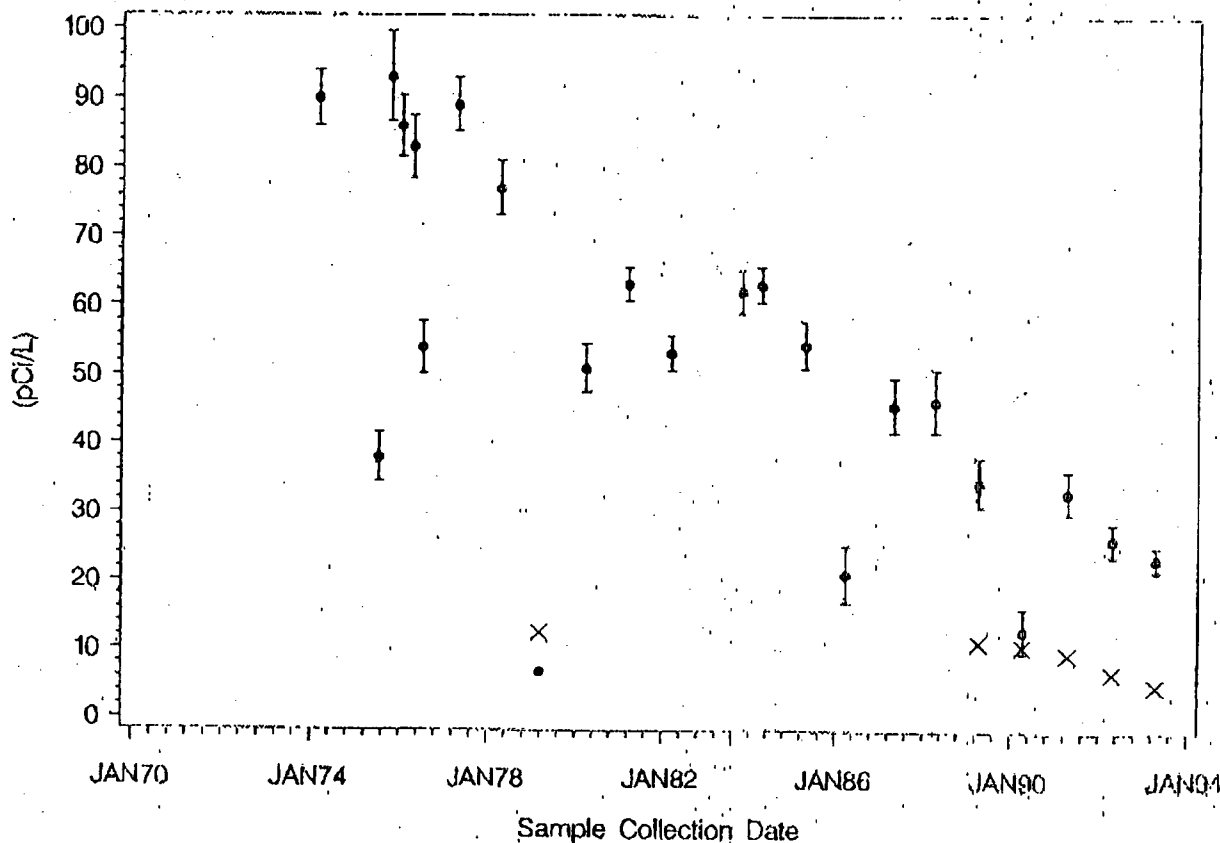


Figure 42. Tritium Result Trends in Baxterville, MS Public Drinking Water Supply - 1993

Well HM-S, Salmon Site, Project DRIBBLE

Tritium vs Normal Tritium Decay

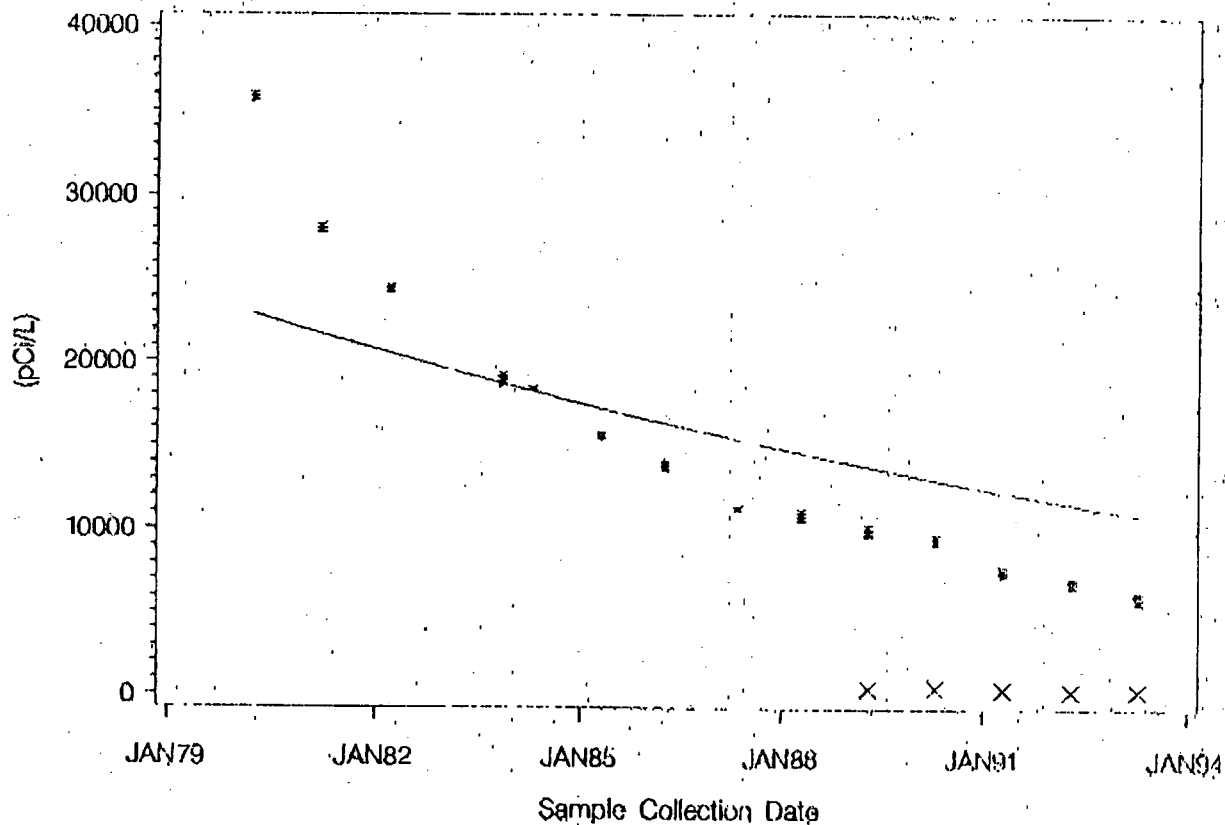


Figure 43. Tritium Results in Well HM-S, Salmon Site, Project DRIBBLE.

Project Milrow samples yielded tritium concentrations ranging from 13 ± 1.6 pCi/L to 36 ± 2.0 pCi/L, corresponding to 0.01 to 0.04 percent of the DCG.

The highest tritium concentrations were observed in samples collected from Project Long Shot sites, ranging from 10 ± 1.1 pCi/L to $1.4 \times 10^5 \pm 130$ pCi/L, equivalent to 0.01 to 1.6 percent of the concentration guide. The highest tritium result was obtained from well GZ No. 1, located near the Project Long Shot cavity. Figure 44 depicts the decreasing trend in tritium activity in this well.

An analysis of the monitoring locations by DRI indicated that none of the sites are suitable for detection of migration (Chapman and Hokett, 1991). Migration from the Project Milrow cavity would likely discharge to the Pacific Ocean, while the Bering Sea is the likely discharge area for migration from Projects Long Shot and Cannikin.

7.5 Summary

None of the domestic water supplies monitored in the LTHMP in 1993 yielded tritium activities of any health concern. The greatest tritium activity measured in any water body which has potential to be a drinking water supply was less than one percent of the limit prescribed by the NPDWRs. In general, surface water and spring samples yielded tritium activities greater than those observed in shallow domestic wells in the same area. This is probably due to scavenging of atmospheric tritium by precipitation. Where suitable monitoring wells exist, there were no indications that migration from any test cavity is affecting any domestic water supply.

In most cases, monitoring wells also yielded no radionuclide activity above the MDC. Exceptions include wells into test cavities, wells monitoring known areas of contamination, and one well at GASBUGGY. Known areas of contamination exist at Project GNOME where USGS conducted a tracer study experiment, some areas onsite at Project DRIBBLE, and a few surface areas near

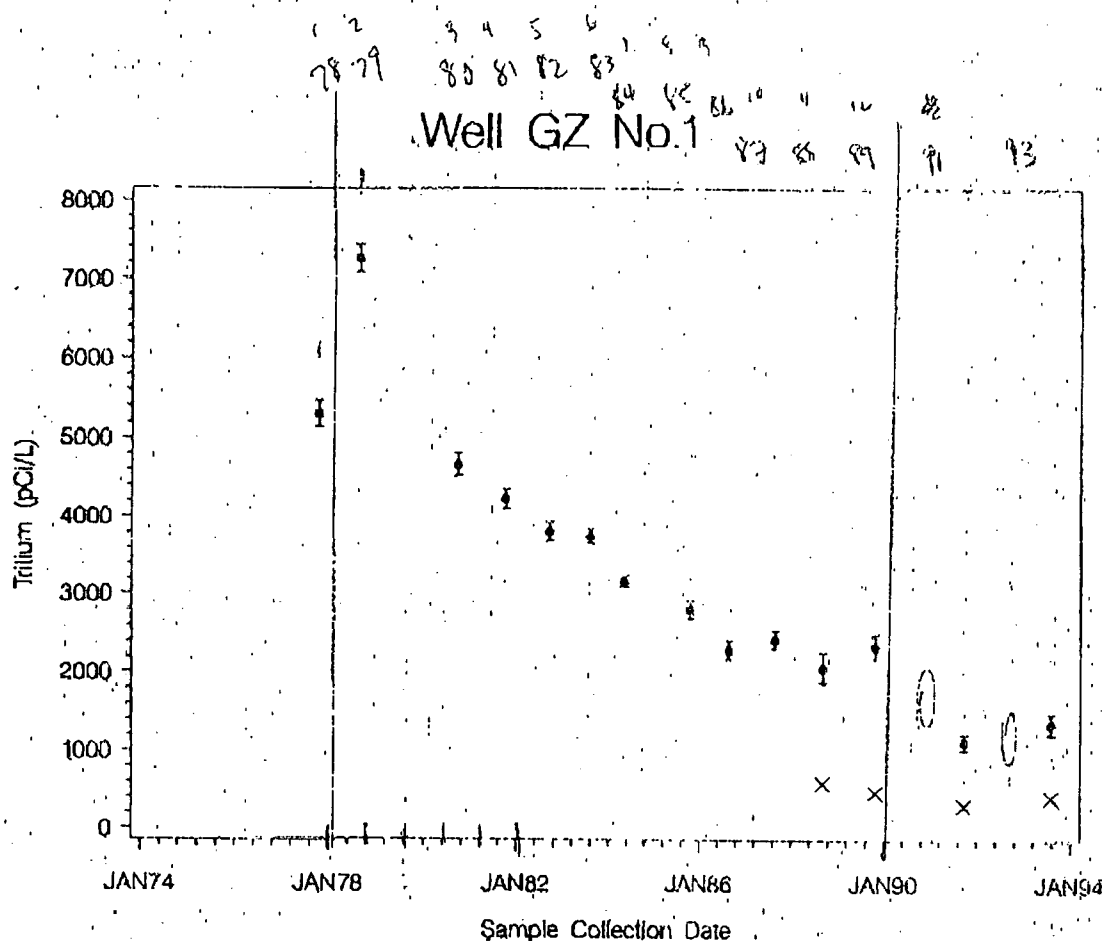


Figure 44. Tritium Results in Water from Well GZ No. 1 near Project LONGSHOT, Amchitka Island, Alaska.

Project LONG SHOT. The 1993 results for these monitoring wells are consistent with decreasing trends observed over time. Monitoring well EPNG 10-36 at Project GASBUGGY was a notable exception to wells showing decreasing trends.

This well is a former gas well located 435 feet northwest of SGZ. The sampling depth of this well is approximately 3600 ft in the Ojo Alamo Sandstone, an aquifer containing nonpotable water. The tritium activity in 1992 was 364 ± 3.4 pCi/L, and in 1991 was 484 ± 4.2 pCi/L, approximately 10 times the historic background activity. An increase in tritium activity was first observed in 1984, seventeen years after the test was conducted. In every year since then, with the exception of 1987, tritium activities have been between 100 and 560 pCi/L, with wide variability sometimes noted between consecutive years. The proximity of the well to the test cavity suggests the possibility that the increased activity may be indicative of migration from the test cavity.

12 TIMES (ANNUALLY)
BETWEEN
77-89
BI ANNUALLY
91-93

- 77 - 1
- 78 - 1
- 79 - 2
- 80 - 3
- 81 - 4
- 82 - 5
- 83 - 6
- 84 - 7
- 85 - 8
- 86 - 9
- 87 - 10
- 88 - 11

Table D-9. Long-Term Hydrological Monitoring Program 1993 Analytical Results for Amchitka Island, Alaska - 1993

Sampling Location	Collection Date	Concentration $\pm 1s$ Tritium (pCi/L)	Percent of Concentration Guide ^(a)
BACKGROUND SITES			
Clevenger Lake	07/30	20 $\pm 1.6^*$	0.02
Constantine Spring	07/30	26 $\pm 1.3^*$	0.03
Constantine Spring-Pump House	07/30	30 $\pm 1.7^*$	0.03
RX-Site Pump House	07/30	14 $\pm 1.4^*$	0.02
TX-Site Springs	07/30	19 $\pm 1.7^*$	0.02
TX-Site Water Tank House	07/30	Not Sampled - Tank Dry, Pump Removed	
Dove Cove Creek	07/31	16 $\pm 1.4^*$	0.02
Jones Lake	07/30	13 $\pm 1.2^*$	0.01
Rain Base Camp	07/31	6.5 $\pm 1.7^*$	0.01
Rain Base Camp	08/01	4.5 $\pm 1.7^*$	0.01
Site D Hydro Exploratory Hole	07/30	Not Sampled - Well Plugged	
Site E Hydro Exploratory Hole	07/30	Not Sampled - Well Plugged	
Well 1 Army	08/01	16 $\pm 1.6^*$	0.02
Well 2 Army	07/30	6.6 $\pm 1.5^*$	0.01
Well 3 Army	07/30	Not Sampled - Well Plugged	
Well 4 Army	07/30	24 $\pm 1.8^*$	0.03
PROJECT CANNIKIN			
Cannikin Lake (North End)	07/29	19 $\pm 1.7^*$	0.02
Cannikin Lake (South End)	07/29	21 $\pm 1.8^*$	0.02
DECON Pond	07/29	Not Sampled - Discontinued	
DECON Sump	07/29	Not Sampled - Discontinued	
DK-45 Lake	07/30	17 $\pm 1.7^*$	0.02
Ice Box Lake	07/29	20 $\pm 1.8^*$	0.02
Pit South of Cannikin GZ	07/29	16 $\pm 1.6^*$	0.02
Well HTH-3	07/29	23 $\pm 1.8^*$	0.03
White Alice Creek	07/29	19 $\pm 1.6^*$	0.02
PROJECT LONG SHOT			
Long Shot Pond 1	08/01	13 $\pm 1.5^*$	0.01
Long Shot Pond 2	08/01	12 $\pm 1.6^*$	0.01
Long Shot Pond 3	08/01	21 $\pm 1.7^*$	0.02
Mud Pit No.1	08/01	102 $\pm 1.9^*$	0.11
Mud Pit No.2	08/01	140 $\pm 2.3^*$	0.16
Mud Pit No.3	08/01	152 $\pm 2.0^*$	0.17
Reed Pond	08/01	10 $\pm 1.1^*$	0.01
Stream East-Longshot	08/01	184 $\pm 2.8^*$	0.20
Well EPA-1	08/01	11 $\pm 1.7^*$	0.01
Well GZ No.1	08/01	1350 $\pm 130^{*(b)}$	1.5

Table D-9. (Long-Term Hydrological Monitoring Program 1993 Analytical Results for Amchitka Island, Alaska - 1993, cont.)

Sampling Location	Collection Date	Concentration \pm 1s Tritium (pCi/L)	Percent of Concentration Guide ^(a)
PROJECT LONG SHOT (Continued)			
Well GZ No.2	08/01	51 \pm 1.5*	0.06
Well WL-1	08/01	12 \pm 1.3*	0.01
Well WL-2	08/01	67 \pm 1.6*	0.07
PROJECT MILROW			
Clevenger Creek	07/31	22 \pm 1.6*	0.02
Heart Lake	07/31	16 \pm 1.5*	0.02
Well W-2	07/31	19 \pm 1.8*	0.02
Well W-3	07/31	15 \pm 1.7*	0.02
Well W-4	07/31	Not Sampled - Well Dry	
Well W-5	07/31	18 \pm 1.6*	0.02
Well W-6	07/31	18 \pm 1.7*	0.02
Well W-7	07/31	16 \pm 1.7*	0.02
Well W-8	07/31	24 \pm 2.1*	0.03
Well W-9	07/31	Not Sampled - Well Under Water	
Well W-10	07/31	18 \pm 1.5*	0.02
Well W-11	07/31	36 \pm 2.0*	0.04
Well W-12	07/31	Not Sampled - Well Under Water	
Well W-13	07/31	18 \pm 2.0*	0.02
Well W-14	07/31	13 \pm 1.6*	0.10
Well W-15	07/31	19 \pm 1.8*	0.02
Well W-16	07/31	Not Sampled - Well Under Water	
Well W-17	07/31	Not Sampled - Well Under Water	
Well W-18	07/31	24 \pm 1.8*	0.03
Well W-19	07/31	Not Sampled - Well Under Water	

Mean MDC: 4.7 pCi/L

Standard Deviation of Mean MDC: 0.7 pCi/L

- * = Concentration is greater than the minimum detectable concentration (MDC).
 (a) = Derived from the ³H ALI in ICRP-30 as 90,000 pCi/L tritium
 (b) = Analysis by conventional method (MDC = 421)